

Performance Monitoring Protocol (QA/QC) for Micrometers and Calipers

1 Scope

This document addresses performance monitoring (QA/QC) of calipers and micrometers. This document applies to Chemistry Unit personnel using the associated instrument(s)/equipment in Metallurgy.

2 Principle

Micrometers and calipers are instruments used to measure physical dimensions to a high degree of precision and accuracy. Micrometers, calipers, and gauge blocks that are used for significant measurements (i.e., a measurement that requires an estimation of measurement uncertainty) in Metallurgy are calibrated annually. The calibration status of a micrometer or caliper will be checked prior to conducting any significant measurement. Other definitions and guidelines for following this protocol are outlined in the “General Instrument Maintenance Protocol.”

3 Equipment/Materials/Reagents

Micrometers, calipers, and standard gauge blocks that require calibration are recorded in Resource Manager in Forensic Advantage (FA).

4 Standards and Controls

Calibrated gauge blocks are used as thickness reference standards to perform calibration checks of micrometers and calipers.

5 Calibration

Micrometers and calipers used for significant measurements, as well as gauge blocks used for calibration checks, will be calibrated annually by a service provider that meets the requirements provided in the *FBI Laboratory Practices for the Calibration and Maintenance of Equipment*. Each micrometer, caliper, and gauge block set is clearly marked with the calibration date and calibration due date. Supporting documentation and calibration certificates are maintained in CU.

6 Sampling

Not applicable.

7 Procedure

7.1 Calibration Check

All micrometers and calipers are clearly marked as 'traceable' or 'not traceable' to indicate whether or not they can be used for a significant measurement. The following 'Calibration Check' procedure will be performed on 'traceable' micrometers and calipers prior to the first use of the instrument to make a significant measurement on a given day. Since the gauge block sets are sent out annually for calibration, the daily 'Calibration Check' will be waived during the time period when they are out for external calibration.

Non-significant measurements on calipers and micrometers (whether 'traceable' or 'not traceable' instruments) do not require a 'Calibration Check'.

- a. Verify that the jaws of the instrument are clean.
- b. Verify that the instrument is properly zeroed.
- c. Refer to the applicable log sheet (also shown below in section 8) and measure each of the indicated gauge blocks, ensuring that the instrument is properly zeroed between measurements. Handle the gauge blocks carefully with lint-free gloves.
- d. Refer to the 'Decision Criteria' (shown below in section 8). If a measured dimension is outside of the 'Tolerance' range, remove the instrument from service and provide the data to the Metallurgy Technical Leader for assessment of its calibration status. Record the appropriate information on the log sheet.
- e. If a micrometer or caliper calibration is found to be out of specification, the Metallurgy Technical Leader will determine whether the instrument will be repaired and recalibrated (by an external service provider), or retired/replaced.

8 Decision Criteria

Compare the measured dimension with the tolerances listed in the table below. Each instrument log sheet is labeled with the instrument resolution and the corresponding tolerances.

Instrument Resolution	'Calibration Check' Gauge Blocks	Tolerance
.001 inches Mitutoyo Micrometers	0.050 inches (MG Block #61083)	± 0.001 inches
	0.500 inches (MG Block #67135)	± 0.001 inches
	1.000 inches (MG Block #70755)	± 0.001 inches
.0005 inches Mitutoyo Calipers	0.050 inches (MG Block # 61083)	± 0.001 inches
	0.500 inches (MG Block #67135)	± 0.001 inches
	2.000 inches (MG Block #70927)	± 0.001 inches

9 Calculations

Not applicable.

10 Measurement Uncertainty

Measurement uncertainty information for CU micrometers and calipers is maintained in the Chemistry Unit.

Measurement uncertainty worksheets are available on ChemNet. The expanded uncertainty is provided at a 99.7% confidence level on the worksheets for a single measurement.

11 Limitations

Only properly trained personnel will perform the 'Calibration Check' procedure.

12 Safety

Take universal precautions when examining bio-hazardous evidence. Personal protective equipment will be worn when the potential for a bio-hazard exists. Refer to the *FBI Laboratory Safety Manual* for detailed information on the proper handling of bio-hazardous materials.

13 References

Manufacturer's Instrument Manuals for the specific models and accessories used.

“General Instrument Maintenance Protocol” (Inst 001) *Instrument Operation and Systems Support SOP Manual*

“Chemistry Unit Procedures for Estimating Measurement Uncertainty” (CUQA 13) *Chemistry Unit Quality Assurance and Operations Manual*

FBI Laboratory Operations Manual

FBI Laboratory Safety Manual

Rev. #	Issue Date	History
1	10/04/18	Updated Section 1 Scope to include applicable disciplines/categories of testing. Changed reference to LOM and QAM in Sections 2 and 5. Updated heading in Section 6. Added 'appropriate instrument support personnel' to Section 7.1 e. Changed 'Metallurgy Subunit Manager' to 'Chemistry Unit' in Section 10. Updated 'Instrument Operation and Systems Support' in Section 13 and header.
2	04/01/21	Edited Scope (and throughout) to apply only to Metallurgy and to clarify that not all micrometers and calipers are calibrated. Changed "thickness reference standards" to "gauge blocks" throughout for consistency (with exception of Section 4.1 heading). Section 2- edited for clarity and to apply only to Metallurgy. Section 3- simplified by referring reader to Resource Manager. Section 5- minor edits for clarity. Section 6- changed title from "Sampling or Sample Selection". Section 7- changed title from "Procedures". Section 7.1- deleted first sentence and minor edits for clarity; step (c)- minor edits for clarity; step (e)- removed IOSS manager/personnel. Section 10- minor edit for clarity. Removed six month check. Section 11- narrowed scope to the 'Calibration Check'. Section 12- corrected typos, removed lint free gloves comment.

Approval

Redacted - Signatures on File

Metallurgy
Technical Leader:

Date: 03/31/2021

IOSS Manager:

Date: 03/31/2021

Chemistry Unit Chief:

Date: 03/31/2021